

1. A microwave filter comprising:
  - a ceramic insert defining a plurality of resonator regions; and
  - an outer body formed from a first conductive material, said first conductive material fully encasing said ceramic insert.

2. The microwave filter of claim 1 wherein each of said plurality of resonator regions further comprises a cavity, said cavity being filled by said first conductive material.
3. The microwave filter of claim 1 wherein each of said plurality of resonator regions further comprises a cavity, said cavity being filled by a corresponding one of a plurality of resonator rods formed from a second conductive material differing in composition from said first conductive material.
4. The microwave filter of claim 3 wherein each of said plurality of resonator rods is shorter than the corresponding cavity to define an air gap.
5. The microwave filter of claim 1 further comprising an input port in said outer body for introducing a signal and an output port in said outer body for extracting a filtered signal.
6. The microwave filter of claim 1 further comprising a plurality of tuning adjustment elements in said outer body, each of said tuning adjustment elements having a portion that projects into one of said resonator regions.
7. The microwave filter of claim 6 wherein said each of each of said plurality of resonator regions further comprises a cavity that receives one of said plurality of tuning adjustment elements, each of said plurality of tuning adjustment elements being shorter than the corresponding cavity to define a  
5 corresponding air gap.

8. The microwave filter of claim 1 wherein said ceramic insert is formed from a machinable ceramic that is resistant structurally to high temperatures and high pressures and that has a low dissipation factor.

9. The microwave filter of claim 6 wherein said ceramic insert is formed from boron nitride.

10. The microwave filter of claim 1 wherein said outer body is molded around said ceramic insert from a molten conductive material.

11. A method of manufacturing a microwave filter comprising:
- forming a ceramic insert having a plurality of resonator regions;
  - placing the ceramic insert inside a die;
  - introducing a molten metal into the die; and
- 5        allowing the molten metal to solidify so as to encapsulate the ceramic insert.

12. The method of claim 11 wherein each of the plurality of resonator regions includes a cavity, and further comprising:
- inserting one of a plurality of resonator rods into each of the cavities.
13. The method of claim 12 wherein each of said plurality of resonator rods is shorter than the corresponding cavity to define an air gap.
14. The method of claim 12 wherein the resonator rod is formed of a first material having a different composition than a second material forming the encapsulating metal.
15. The method of claim 11 wherein each of the plurality of resonator regions has a cavity, and introducing the molten metal further comprises:
- allowing the molten metal to fill each cavity thereby forming a corresponding resonator rod.
16. The method of claim 11 further comprising:
- machining the solidified metal to add an input port and an output port.
13. The method of claim 8 further comprising:
- adding a plurality of tuning adjustment elements each associated with a resonator region.

14. The method of claim 8 wherein the ceramic insert is formed by a manufacturing technique selected from the group consisting of ceramic injection molding, casting and extruding.